KH

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/812,561	03/30/2004	Lei Duan	50T5601.01/1696	3671

24272 7590 10/09/2007

Gregory J. Koerner
Redwood Patent Law
1291 East Hillsdale Boulevard
Suite 205
Foster City, CA 94404

EXAMINER
HERNANDEZ, JOSIAH J

ART UNIT	PAPER NUMBER
2626	

MAIL DATE	DELIVERY MODE
10/09/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/812,561	DUAN ET AL.	
	Examiner	Art Unit	
	Josiah Hernandez	2626	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-42* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-42* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *30 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *06/10/2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1, 3, 5, 7-11, 16, 21, 23, 25, 27-31, 36, 41, and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gao et al. (US 7,275,029) in view of Bellegarda (US 6,778,952).

As to claims 1, 21, 41, and 42, Gao discloses a system for optimizing speech recognition procedures (abstract lines 1-2), comprising: initial language models each created by combining source models (column 14 lines 35-40) according to interpolation coefficients that define proportional relationships for combining said source models (column 14 lines 40-45); a speech recognizer (column 5 lines 26-29) that utilizes said initial language models to process input development data (probability is calculated from each of the models to create an optimum combination, column 14 lines 22-40) for calculating probability that each correspond to a different one of said initial language models (column 14 lines 38-

43); and an optimized language model selected from said initial language models by identifying an optimal probability from among said probabilities (column 14 lines 35-45), said speech recognizer utilizing said optimized language model for performing said speech recognition procedures (column 5 lines 26-29).

Gao does not disclose specifically using or calculating word-error rates. Bellagarda teaches calculating and combining the probabilities of the language models (abstract lines 1-3) in order to reduce in an optimal form the word-error rate (column 1 lines 38-45).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Gao with the use of word-error rates as taught by Bellegarda. Doing so would have allowed to optimize the language model by using the word-error rate as an indicator of how much to rely on a particular language model.

As to claims 3 and 23, Gao discloses the system of claim 1 wherein said initial language models are implemented as statistical language models that include N-grams and probability values that each correspond to one of said N-grams (column 8 lines 15-23).

As to claims 5 and 25, Gao does not disclose specifically the system of claim 1 wherein said source models are each similarly implemented as statistical language models that include N-grams and probability values that each

correspond to one of said N-grams. Bellegarda teaches using statistical models (column 3 lines 1-8) that include N-grams and probability values (column 4 lines 38-48).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Gao with the use of N-grams and probability values as taught by Bellegarda. It is commonly known in the art that N-grams and probability values are using in statistical models.

As to claims 7 and 27, Gao discloses the system of claim 1 wherein sets of said interpolation coefficients are each associated with a different one of said source models to define how much said different one of said source models contributes to a corresponding one of said initial language models (the interpolation coefficients are combined in weighted amounts, column 14 lines 40-45).

As to claims 8 and 28, Gao discloses the system of claim 1 wherein said interpolation coefficients are each multiplied with a different one of said source models to produce a series of weighted source models that are then combined to produce a corresponding one of said initial language models (the interpolation coefficients are combined in weighted amounts, column 14 lines 40-45).

As to claims 9 and 29, Gao discloses the system of claim 1 wherein said initial language models are each calculated by a formula:

LM=.lambda..sub.1SM.sub.1+.lambda..sub.2SM.sub.2- + . . .

+.lambda..sub.nSM.sub.n where said LM is one of said initial language models, said SM.sub.1 is a first one of said source models, said SM.sub.n is a final one of said source models in a continuous sequence of "n" source models, and said .lambda..sub.1, said .lambda..sub.2, and said .lambda..sub.n are said interpolation coefficients applied to respective probability values of said source models to weight how much each of said source models contributes to said one of said initial language models (a formula is used to calculate by a percentage weight the amount of each language model and it is determined by the probabilities of optimizing the accuracy of recognition, column 14 lines 40-45).

As to claims 10 and 30, Gao does not disclose specifically the system of claim 1 wherein said interpolation coefficients are each greater than or equal to "0", and are also each less than or equal to "1", a sum of all of said interpolation coefficients being equal to "1". It is inherent to one having ordinary skill in the art at the time the invention was made that when a formula is made using probability weights in a linear equation, the weights are expressed in value intervals of 0-1, 1 being 100% and 0 being 0%. This method is commonly used in statistical methods.

As to claims 11 and 31, Gao discloses the system of claim 1 wherein said interpolation coefficients for creating said optimized language model are selectively chosen by analyzing effects of various combinations of said interpolation coefficients upon said word-error rates that correspond to recognition accuracy characteristics of said speech recognizer, said optimized language model being directly implemented by minimizing said optimal word-error rate through a selection of said interpolation coefficients (the combination of language models is done by finding the best combination (optimization of language performance, column 3 lines 24-30) in order to increase accuracy rates, column 14 lines 35-45 and column 9 lines 10-22).

As to claims 16 and 36, Gao discloses the system of claim 1 wherein an interpolation procedure for combining said source models into one of said initial language models is performed by utilizing a selected initial set of said interpolation coefficients (column 14 lines 35-45).

5. Claims 6 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gao et al. (US 7,275,029) in view of Bellegarda (US 6,778,952) as applied to claim 1 and in further view of Newman et al (US 6,151,575).

As to claims 6 and 26, Gao or Bellegarda do not disclose specifically the system of claim 1 wherein each of said source models corresponds to a different

application domain that is related to a particular speech environment. Newman teaches combining an initial and source language model (abstract lines 1-5) and the different models corresponding to different application domain that is related to a particular speech environment such as particular speakers or groups of related speakers (column 2 lines 44-47).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Gao with the use of models of different domains as taught by Newman. Doing so would have allowed for the system to be diversified enough to have accurate speech recognition for different areas and domains of speech (column 2 lines 44-47).

5. Claims 2, 4, 12, 13, 17-20, 22, 24, 32, 33, and 37-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gao et al. (US 7,275,029) in view of Bellegarda (US 6,778,952) as applied to claim 1 and in further view of Mahajan et al. (US 6,418,431).

As to claims 2 and 22, Gao or Bellegarda do not disclose specifically the system of claim 1 wherein said word-error rates are calculated by comparing a correct transcription of said input development data and a top recognition candidate from an N-best list that is rescored by a rescoring module for each of said initial language models. Mahajan teaches building language models (abstract lines 1-4) and combining features from different language models into

one (abstract lines 9-14) and calculating N-best list and rescoring and combining (column 7 lines 15-22).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Gao with the use of N-best lists as taught by Mahajan. Doing so would have allowed optimizing the language model by using the N-best lists as an indicator of how much to rely on a particular language model.

As to claims 4 and 24, Gao or Bellegarda do not disclose the system of claim 1 wherein said input development data includes a pre-defined series of word sequences from which said recognizer rescores a corresponding N-best list for calculating said word-error rates. Mahajan teaches building language models (abstract lines 1-4) and combining features from different language models into one (abstract lines 9-14) and calculating N-best list and rescoring and combining (column 7 lines 15-22).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Gao with the use of N-best lists as taught by Mahajan. Doing so would have allowed optimizing the language model by using the N-best lists as an indicator of how much to rely on a particular language model.

As to claims 12 and 32, Gao or Bellegarda do not disclose specifically the system of claim 1 wherein a rescoring module repeatedly processes said input development data to rescore an N-best list of recognition candidates for calculating said word-error rates by comparing a top recognition candidate to said input development data, said recognition candidates each including a recognition result in a text format, and a corresponding recognition score. Mahajan teaches building language models (abstract lines 1-4) and combining features from different language models into one (abstract lines 9-14) and calculating N-best list and rescoring and combining (column 7 lines 15-22).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Gao with the use of N-best lists as taught by Mahajan. Doing so would have allowed optimizing the language model by using the N-best lists as an indicator of how much to rely on a particular language model.

As to claims 13 and 33, Gao or Bellegarda do not disclose specifically the system of claim 1 wherein each of said word-error rates are calculated by comparing a correct transcription of said input development data and a top recognition candidate from an N-best list of recognition candidates provided by said speech recognizer after processing said input development data, said top recognition candidate corresponding to a best recognition score from said speech recognizer. Mahajan teaches building language models (abstract lines 1-

4) and combining features from different language models into one (abstract lines 9-14) and calculating N-best list and rescoring and combining (column 7 lines 15-22).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Gao with the use of N-best lists as taught by Mahajan. Doing so would have allowed optimizing the language model by using the N-best lists as an indicator of how much to rely on a particular language model.

As to claims 17 and 37, Gao or Bellegarda do not disclose specifically the system of claim 16 wherein a rescoring module rescores an N-best list of recognition candidates after utilizing said one of said initial language models to perform a recognition procedure upon said input development data. Mahajan teaches building language models (abstract lines 1-4) and combining features from different language models into one (abstract lines 9-14) and calculating N-best list and rescoring and combining (column 7 lines 15-22).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Gao with the use of N-best lists as taught by Mahajan. Doing so would have allowed optimizing the language model by using the N-best lists as an indicator of how much to rely on a particular language model.

As to claims 18 and 38, Gao or Bellegarda do not disclose specifically the system of claim 17 wherein one of said word-error rates corresponding to said one of said initial language models is calculated and stored based upon a comparison between a correct transcription of said input development data and a top recognition candidate from said N-best list. Mahajan teaches building language models (abstract lines 1-4) and combining features from different language models into one (abstract lines 9-14) and calculating N-best list and rescoring and combining (column 7 lines 15-22).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Gao with the use of N-best lists as taught by Mahajan. Doing so would have allowed optimizing the language model by using the N-best lists as an indicator of how much to rely on a particular language model.

As to claims 19 and 39, Gao discloses the system of claim 18 wherein said selected initial set of said interpolation coefficients are each iteratively altered by a pre-defined amount to produce subsequent sets of said interpolation coefficients (column 14 lines 35-45).

As to claims 20 and 40, Gao discloses the system of claim 19 wherein subsequent initial language models are created by utilizing said subsequent sets of interpolation coefficients (column 14 lines 35-45).

Gao or Bellegarda do not disclose specifically a rescoring module iteratively utilizing said subsequent initial language models to rescore said N-best list for calculating subsequent word-error rates, said optimized language model being selected by identifying said optimal word-error rate when a pre-determined number of said subsequent word-error rates have been calculated. Mahajan teaches building language models (abstract lines 1-4) and combining features from different language models into one (abstract lines 9-14) and calculating N-best list and rescoring and combining (column 7 lines 15-22).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Gao with the use of N-best lists as taught by Mahajan. Doing so would have allowed optimizing the language model by using the N-best lists as an indicator of how much to rely on a particular language model.

5. Claims 14, 15, 34, and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gao et al. (US 7,275,029) in view of Bellegarda (US 6,778,952) as applied to claim 1 and in further view of Deligne et al. (US PGPUB 2004/0199385).

As to claims 14 and 34, Gao or Bellegarda do not disclose specifically the system of claim 1 wherein said word-error rates are calculated to include one or more substitutions in which a first incorrect word has been substituted for a first correct word in a recognition result, said word-error rates also including one or

more deletions in which a second correct word has been deleted from said recognition result, said word-error rates further including one or more insertions in which a second incorrect word has been inserted into said recognition result. Deligne teaches techniques for improving speech processing (abstract lines 1-4) and that include a word-error rate calculation (paragraph [0048]) of which include in their formula deletions, insertions, and substitutions (paragraph [0045]).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Gao with the use of deletions, insertions, and substitutions as disclosed by Deligne. Doing so would have provided a method to measure quality of the language models (paragraph [0045] lines 1-3).

As to claims 15 and 35, Gao or Bellegarda do not disclose the system of claim 1 wherein said word-error rates are each calculated according to a formula: WER=(Subs+Deletes+Inserts)/Total Words in Correct Transcription where said WER is one of said word-error rates corresponding to one of said initial language models, said Subs are substitutions in a recognition result, said Deletes are deletions in said recognition result, said Inserts are insertions in said recognition result, and said Total Words in Correct Transcription is a total number of words in a correct transcription of said input development data. . Deligne teaches techniques for improving speech processing (abstract lines 1-4) and that include a word-error rate calculation (paragraph [0048]) of which include in their formula

deletions, insertions, and substitutions in the form of a formula (paragraphs [0045]-[0046])

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Gao with the use of deletions, insertions, and substitutions as disclosed by Deligne. Doing so would have provided a method to measure quality of the language models (paragraph [0045] lines 1-3).

Conclusion

A note has been made to notify the appropriate parties that the examiner has moved from Art Unit 2609 to 2626.

Any inquiry concerning this communication should be directed to Josiah Hernandez whose telephone number is 571-270-1646. The examiner can normally be reached from 7:30 pm to 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Hudspeth can be reached on (571) 272-7843. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JH

DAVID HUDSPETH
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600